Attorney Docket No. 31000-000001/US

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF:	: CONF. NO. 7006
Tsukasa YAMASAKI ET AL	: EXAMINER: Kevin Kerns
SERIAL NO.: 10/087,737	: GROUP: 1725
FILED: MARCH 5, 2002	:
FOR: BUILD-UP MOLD FOR CONTINUOUS CASTING	:

DECLARATION UNDER 37 C.F.R. §1.132

COMMISSIONER OF PATENTS
P.O. BOX 1450
ALEXANDRIA, VA 22313-1450

SIR:

I, Yasuhiko Kinoshita, hereby declare

1. I am the Director and General Manager, Technical Division, Japan Engineering Network Co., Ltd., where my mailing address is 1183-1, Oaza-baba, Buzen-shi, Fukuoka, Japan 828-0004.

2. My academic background is as follows:

   University of Miyazaki, Miyazaki, Japan, Department of Mechanical Engineering, Faculty of Engineering, and I received my degree in 1973.

3. My industry experience is as follows:

   I have over 20 years of experience in the area of designing continuous casting molds. From 1974 to 1998, I worked for Mishima Kosan Co., Ltd., Kitakyushu, Fukuoka,

Japan. From 1978 to 1988, I was responsible for designing continuous casting molds, and deputy manager of the designing department in charge of continuous casting molds and metal molds.

4. In preparing this Declaration, I have read and considered at least the following documents pertaining to the above-identified patent application: (1) The Official Action dated April 22, 2003; (2) the Amendment filed July 22, 2003 (3) the Official Action dated July 29, 2003. Furthermore I have read the following United States Patents: (1) U.S. Patent No. 5,207,266 to Nakashima et al.; (2) U.S. Patent No. 4,640,337 to Sevastakis, all of which have been asserted as prior art against the present application.

5. I authored the attached Appendix A. Appendix A summarizes the unexpected results achieved by the present application and underscores the nonobviousness of the present application over the cited references. I have generated computer models used in Appendix A with the ANSYS software program using the finite element method and structural and thermal analysis tools. The ANSYS software is well known and commonly used in the field of designing continuous casting molds. Appendix A was reviewed during a personal interview with Primary Examiner Kuang Lin and Examiner Kevin Kerns conducted by Applicants' Attorney Timothy J. Maier on October 16, 2003.

6. In light of the comments and arguments presented in Appendix A, it is my opinion that the design of the present application is superior to the Nakashima and Sevastakis either taken individually or in combination. Further it is my opinion that the cooling channels of Nakashima contain straight lines and do not have large and small curvatures making it impossible to attain the uniform cooling temperatures in the present application.

7. I further state that all statements made herein to my own knowledge are true and that all statements made herein on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both under

Section 1001 of Title 18 of the United States Code and that such any willful false statements may jeopardize the validity of the application or any registration resulting therefrom.

Yasuhiko Kinoshita

Yasuhiko KINOSHITA

November 25, 2003

Dated

APPENDIX A

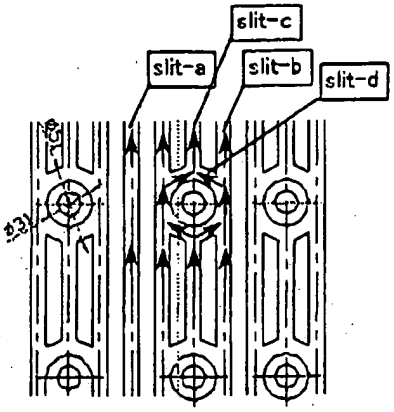
Sept. 27, 2003

Reference Material (Applicant's comment)
(US Application No: 10/87,737 "Build-up Mold for Continuous Casting")

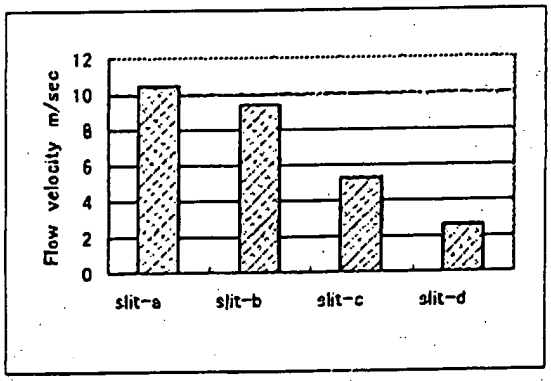
Japan Engineering Network Co., Ltd.
Inventor: Yasuhiko Kinoshita

1. The currently applied slit design is fundamentally different from that of Nakashima et al. (U.S. 5,207,266) wherein, while slit grooves repeat bifurcation and connection, the cross-sectional area of the cooling channels changes at the bifurcations.
The reason is as follows:

(1) In the design of repeated bifurcation and connection, several types of slit grooves exist and the respective slit grooves are significantly different in the flow velocity of cooling water.



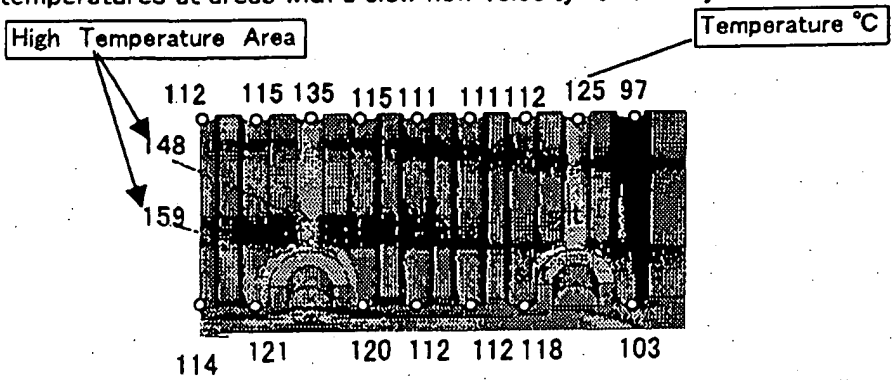
Existing Design



Flow velocity calculation example

This change in the flow velocity is mainly caused by a pressure loss that occurs at bifurcation, connection, and a change in the cross-sectional area, and this cannot be eliminated in a design where bifurcation and connection are repeated.
The design disclosed by Nakashima et el. (U.S. 5,207,266) responds with partial narrowing of the cooling channels by expanding the cross-sectional area of the part where flows merge. However, from this method, only the effect to expand the partially narrow cross-sectional area is expected, and the pressure loss as a result of bifurcation or connection cannot be eliminated, therefore, the flow velocity cannot be made uniform.
The flow velocity of cooling water in the slit grooves is an important factor in changing cooling characteristics, and uniformity of the flow velocity is indispensable for a cooling design of a mold for continuous casting, in which uniform cooling is required.

(2) The above-described change in the flow velocity greatly influences cooling capacity, and temperatures at areas with a slow flow velocity remarkably rise.

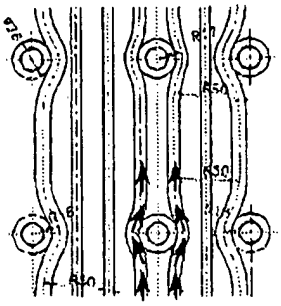


This rise in temperature of the cooling wall induces boiling of the cooling water and accelerates uneven cooling, thus causing a harmful influence on the quality of molding pieces.

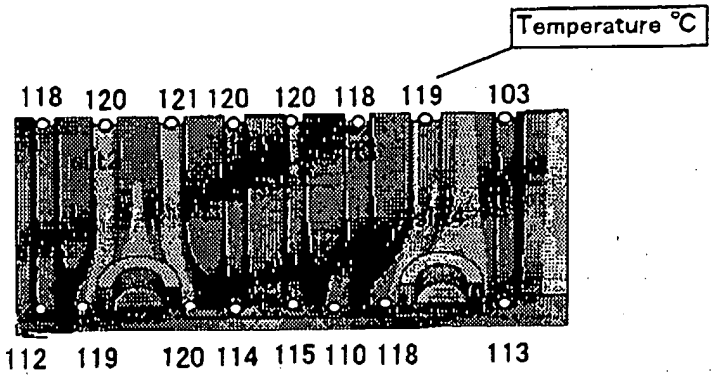
(3) In the currently applied design of slit grooves with a curvature and with different widths, slit grooves are independent and no bifurcation or connection occurs in the course of a flow, and no change in the cross-sectional area occurs. Accordingly, there is no change in the flow velocity in one slit groove, thus a stable flow can be attained.

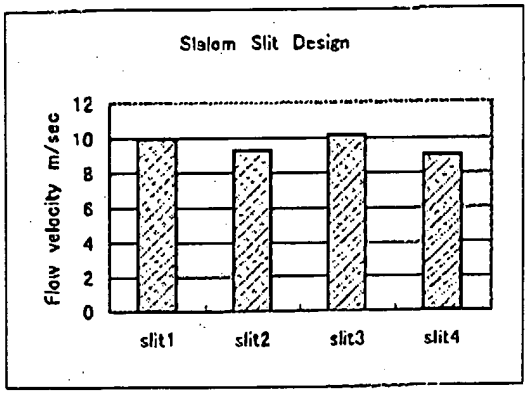
In addition, the present application is characterized in that, if the bending degree changes depending on the arrangement of slit grooves, the flow velocity of a slit groove with a large bending is slow, therefore, by changing the widths of slit grooves, slit grooves with different curvatures are set to be made uniform in pressure loss.

A design example thereof is shown in the following.



Slalom Slit Design

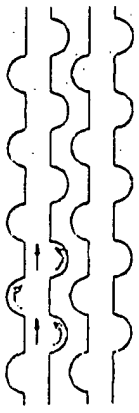




As can be understood from this example, the flow velocity of cooling water has been made uniform, and the temperature of the slit grooves has also been made uniform.

Accordingly, the present application is different from Nakashima et al. (U.S. 5,207,266). which eliminates partial narrowing of sections in channels on the premise that bifurcation and connection exist.

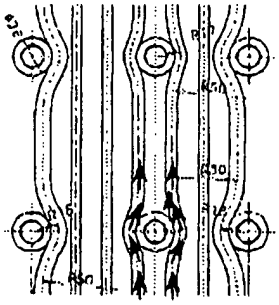
2. In Sevastakis (U.S. 54,640,337). as in the view at the right, semicircular overhanging channels are alternatively provided in one slit groove. This is a design wherein cooling water flows while the cross-sectional area of the cooling channel is being changed at all times, and presumably, whirlpools ar stirring caused by a change in the cross-sectional area or effects of an increase in the cooling area are expected.



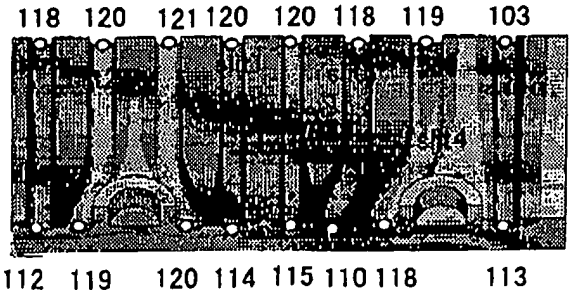
Sevastakis (U.S 54,640,337)

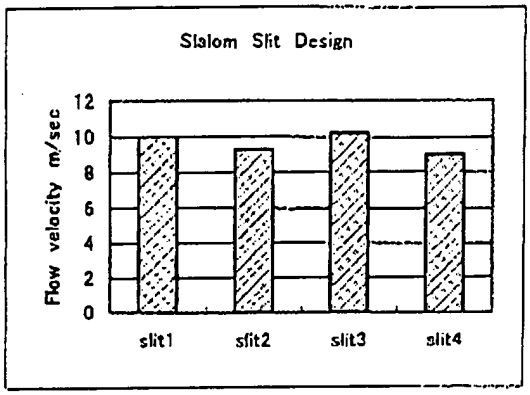
The present application is a design characterized in that the curvature is provided not for the purpose of obtaining a stirring effect and a surface area effect, while no change in the cross-sectional area occurs in one channel, the flow velocity of cooling water is made uniform and a partial change in cooling capacity is reduced by changing the width of the slit grooves according to the curvature that changes depending on the arrangement.

Slalom Slit Design(Patent Application)

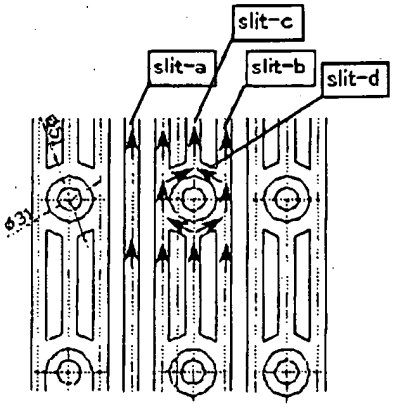


Slalom Slit Design





Existing Design



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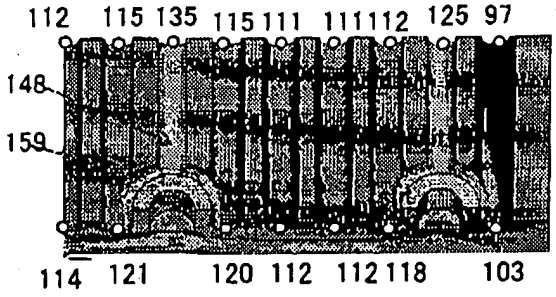

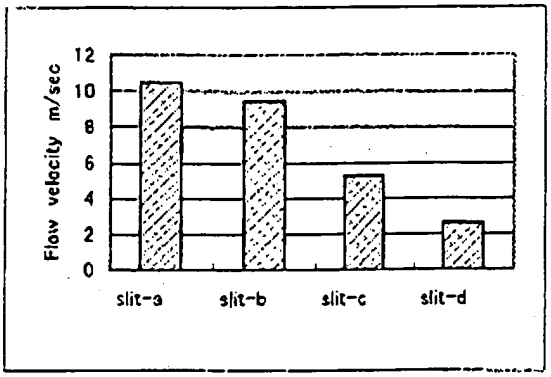

Cited from Himeji 250_300

Slalom

Volume of water 340 l/min	slit1	slit2	slit3	slit4
Slit width*depth (mm)	6.5*6	8*6	8*6	10*6
Flow velocity (m/n)	10	9.27	10.15	9
Heat transfer coefficient ($kcal/m^2/hr/°C$)	35700	32900	35400	31400

Kikko

Volume of water 375 l/min	slit-a	slit-b	slit-c	slit-d
Slit width*depth (mm)	10*5	10*5	10*5	10*5
Flow velocity (m/n)	10.45	9.4	5.22	2.61